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Peak Oil in the Spotlight

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Crossroads Crises in Perspective (Part 4) – Peak Oil in the Spotlight

**

This series of essays contains readings of reports, articles, and presentations that are in the public domain, with provided references. Readers are encouraged to approach the text with critical yet open minds.

**

Introduction

The crossroads that the world has arrived at is a transition from expansion to contraction on several levels, which is why a lot of emphases is placed on *decentralisation* in this

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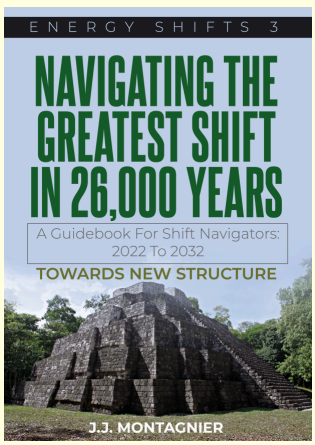
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series. Few people are aware that *decentralisation* will become increasingly important in the coming years, while global solutions presently on offer are typically geared toward further expansion and *centralisation.*

A shift from *a centralised to a decentralised paradigm* will be facilitated by *metaphysical cyclic shifts,* as well as constraints on some of the natural resources that are required for further unlimited global growth and expansion. Consequently, human populations will be challenged with many adjustments and even turnarounds, ultimately resulting in *a return to a more natural order.*

This chapter explores the world's energy and mineral dependencies and probes whether industrialised civilisations could comprehensively transition away from fossil fuels. The implications of *a peak oil scenario* are explored with geopolitical developments placed within this context. The importance of fossil fuels in terms of what they do for us is a necessary starting point.

Our Energy Dependencies

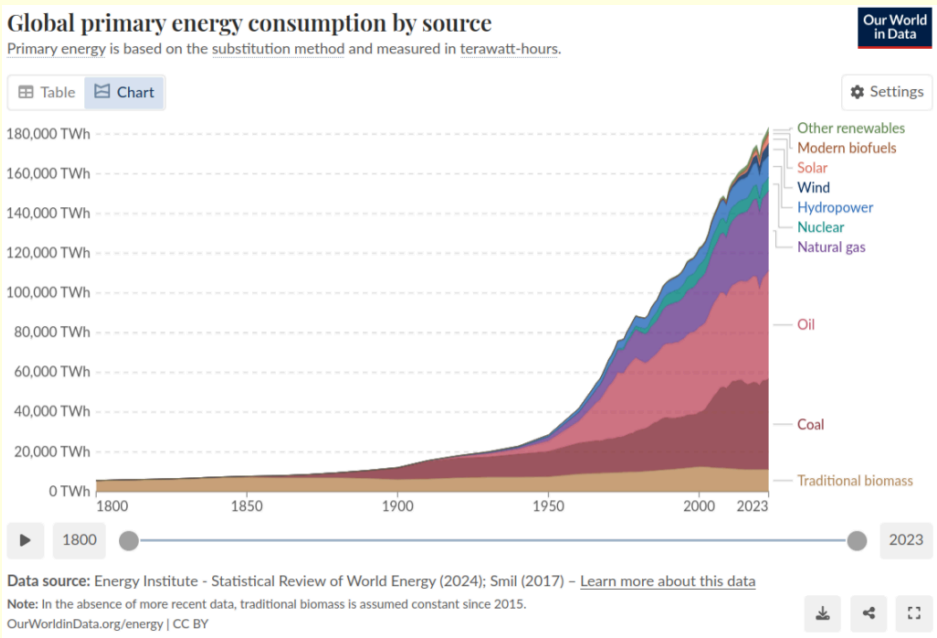

Fig. 1 – Global Primary Energy Consumption by Source – Our World in Data [source] 1

All industrial economies are dependent on fossil fuels for their economic growth. In our modern world, all humans greatly benefit from fossil fuels in numerous invisible ways. The only exceptions to that rule are people situated in faraway rural areas or regions where modernity is mostly lacking. In some cases, modern people choose to live their lives as organically as possible, but that is rare.

Notwithstanding the *global energy transition* that is underway, our modern industrial civilisation remains predominantly fossil fuel-based. Recent energy analyses have shown that *renewable energy production* consisting primarily of solar and wind power (excluding hydropower) constitutes only *a fraction* of global energy production at a mere 16% by 2023, according to a 2024 2 IEA report.

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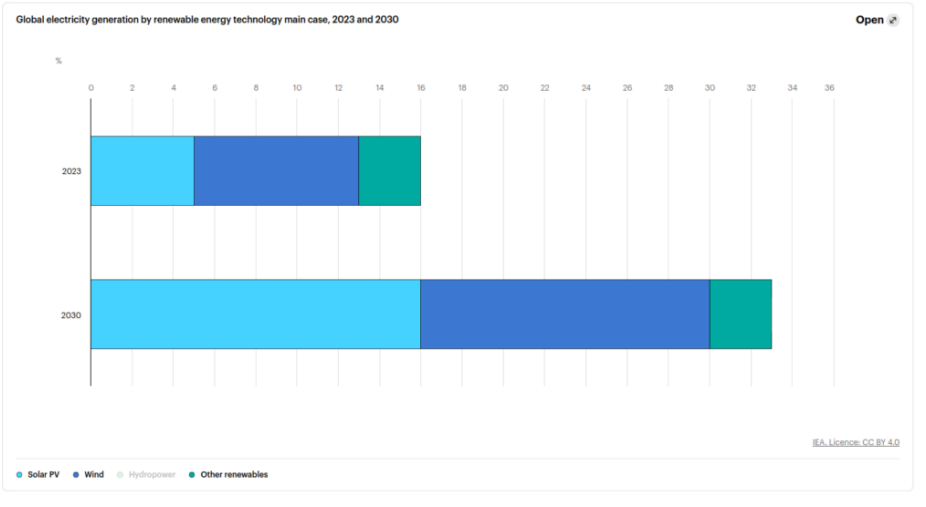
Global electricity generation by renewable energy technology main case, 2023 and 2030
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Solar PV
Wind
Hydropower
Other renewables

Fig. 2 – Global Electricity Generation by Renewable Technology Main Case, 2023 and 2030 [source] 2

It is estimated that by 2030, fossil fuels will still provide as much as 75% 2 of energy supplies to meet global demand, notwithstanding expected growth in the *renewable energies sector.* Interestingly, oil consumption and coal production hit record highs in 2023, with fossil fuels providing 81.5% of total primary energy 3, 4 consumption. Furthermore, it is believed that *renewable energies* are not growing fast enough to displace fossil fuels due to the accelerating demands for oil, natural gas, and coal.

Energy and the Economy

Easily attainable, low-cost, liquid fossil fuels are *indispensable* for economic growth because fossil fuels *underpin* modern economic growth. Unknown to many is that energy and the economy are inextricably linked, with GDP typically rising and falling 5 in relation to the volume of fossil fuels consumed.

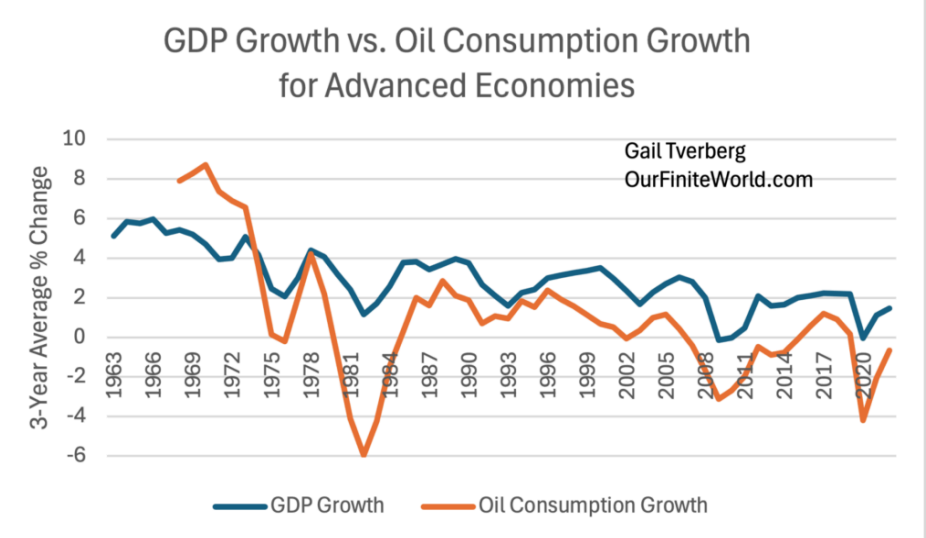

Fig. 3 – Oil Consumption Growth vs GDP Growth of Advanced Economies [source] 5

Should global liquid fossil fuel production and distribution become seriously constrained, global economic growth would be negatively impacted as global energy markets are, to a large extent, centrally managed and coordinated. In a nutshell, the economies of the world are much less resilient today than they would otherwise have been if they had remained more *decentralised.*

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Unlike environmental, climate and population crises, which could be managed locally or regionally (as discussed in *A Crisis in Thinking and The Way Out*), a *serious energy crisis* as a result of severe constraints on liquid fossil fuel supplies could be expected to impact virtually all economies due to international fossil fuel energy dependencies.

Periodic Energy Interruptions

The *economic growth paradigm,* with its wealth-generating capacities and modern-day conveniences, is a very much taken-for-granted one. Due to the relative *infrequency* of global oil supply interruptions, the *precariousness* of stable oil supplies is not commonly well understood or often reflected upon.

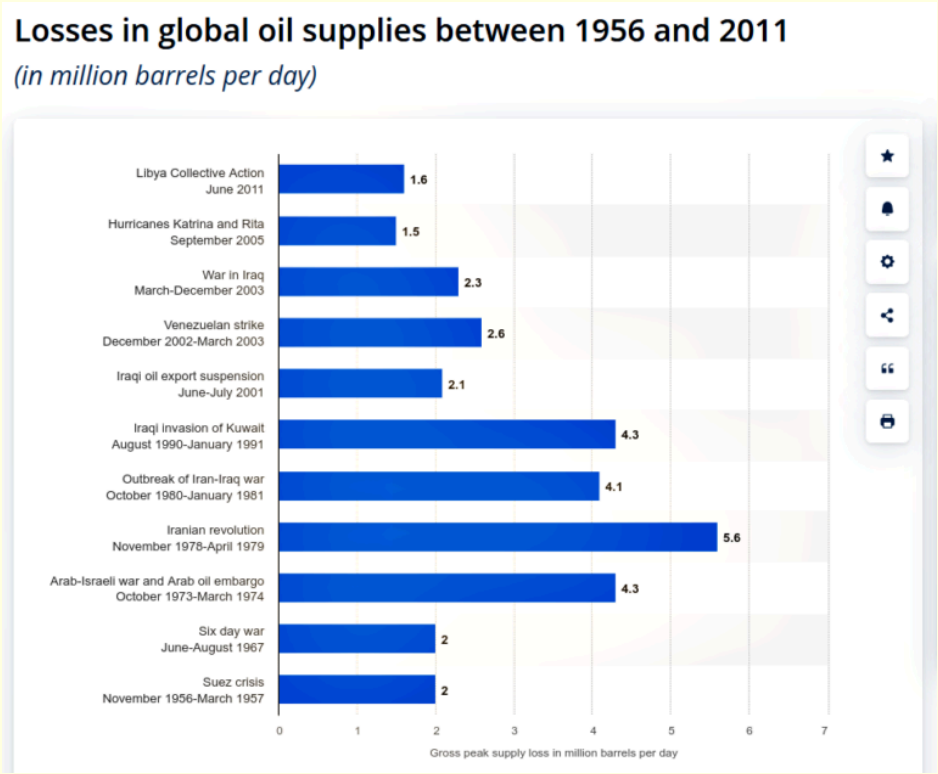

Fig. 4 – Losses in Global Oil Supplies between 1956 and 2011 [source] 6

Although wide-scale interruptions in oil and gas supplies have historically been relatively few and far between, they had far-reaching consequences. Examples were the Arab-Israeli war and Arab oil embargo (1973-1974), the Iranian Revolution (1978-1979), Iraq's invasion of Kuwait (1990-1991) and the Iran-Iraq war (1980-1981). 6

More recently, constraints in natural gas supplies from the Russian Federation into Europe have severely impacted energy prices in the EU since the Russo-Ukrainian war commenced in February 2022. It remains an open question of whether Europe would be able to adequately substitute gas supplies from Russia 7-9, considering that natural gas deliveries were *completely suspended* (after reduced flows since 2022) on the 1st of January 2025 10.

An Easy Enemy

Thinking of fossil fuels as an enemy or even as *the* enemy is a common reaction among activists, but as already established in prior essays, carbon dioxide levels are at the low end of the historical spectrum 11, 12 when viewing *long-term historical trends*, placing an important question mark behind claims that CO_2 emissions pose an imminent threat to humanity.

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If fossil fuels should make way for alternative energies, the latter should ideally be *less damaging* to the natural environment, not more so, considering that it is the harmful impacts of fossil fuels that are highlighted as the main reason for having to switch over to "clean" or "green" energy solutions. However, the practical reality is that renewable energies are only *less obviously* harmful to the natural environment, but not less so in practice – when implemented *at scale* on a long-term basis.

As previously argued (in *Truth and Energy at the Crossroads),* cross-sector economic interests in the *green economy* contribute to blind spots with regard to the negative environmental impacts of the *energy transition* itself. Said differently, *green-washing* the not-so-green *energy transition* while not noticing the *green-washing* has become the norm.

Introducing Peak Oil

Many policymakers, industry leaders, politicians, think tanks, thought leaders and innovators suffer from what is known as *energy blindness* to varying degrees*,* highlighting that *independent research* is required on the subject of *peak oil,* which necessitates weighing up analyses from a range of perspectives.

Peak oil predictions are typically regarded with scepticism by the general public since the notion of human prosperity declining at some point is often interpreted as either being *conspiratorial* or as an *attack on people's way of life.*

Such scepticism is particularly noticeable within alternative media circles. For this reason, the subject of *peak oil* is given special attention in this chapter to arrive at solid answers about *whether peak oil is real – or not.*

Background Understanding

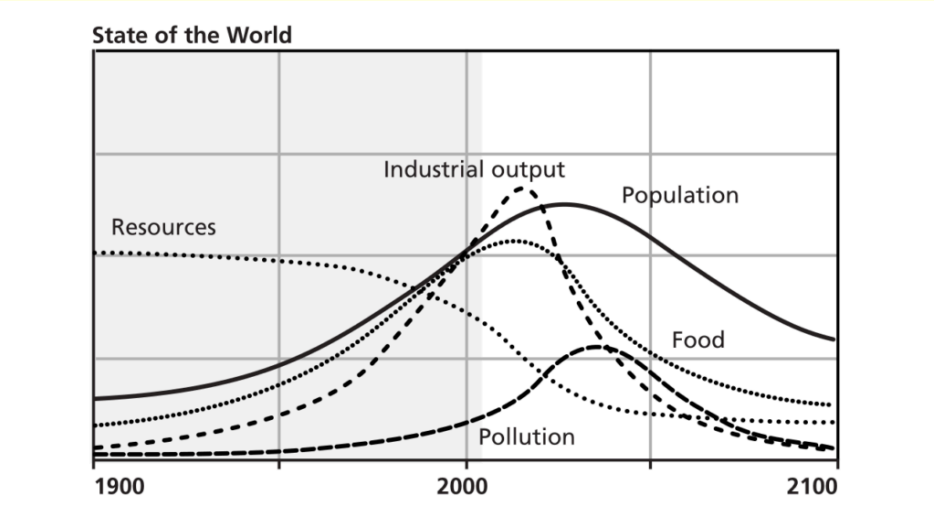

Fig. 5 – Limits to Growth – World 3 Scenario 1 [2004] based on Standard Run Scenario [1972] [13]

Reports have been emerging since the 1970s that the world would one day face resource limits. The most prominent was "The Limits to Growth" (LTG) in 1972 [14], commissioned by the *Club of Rome*. In that report, it was estimated that *peak oil* would unfold sometime during the mid-2020s, more or less from 2025 onward (according to a 2004 [13] update based on the first edition of LTG [14]). A general decline was expected to follow, lasting many decades.

Notwithstanding *peak oil scepticism,* periodic follow-up analyses have indicated that LTG reports had indeed been *relatively accurate* in some of their future modelling, especially in

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relation to a future decline of *conventional liquid fossil fuels.* Today, it can be observed that *real-world trends* have correlated relatively well with some of the LTG modelling (compare, for example, Fig. 5 and Fig. 6).

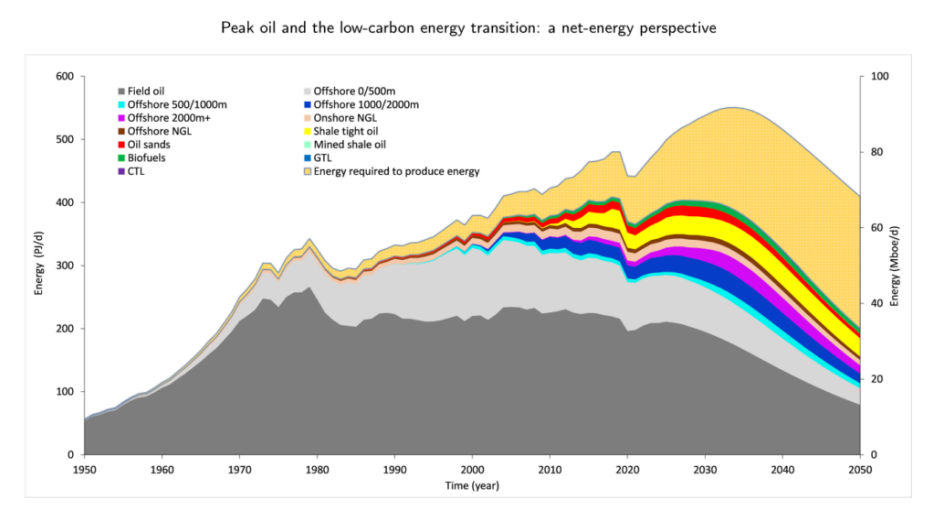


Fig. 6 – Average Oil Liquids Net-energy Production from 1950 to 2050, Compared to the Gross Energy [source] [15]

A report of 2021 [15], which evaluated a number of follow-up reports to the LTG, stated it as follows:

> *Our society can be described as a thermodynamic system that profoundly relies on abundant cheap energy sources such as petroleum to thrive. However, the rapid growth in the use of this non-renewable fossil fuel has undermined its future availability, leaving little doubt that an all-oil liquids peak will take place in the next 10 to 15 years. – Delannoy et al. (Peak Oil and the Low-carbon Energy Transition: A Net-energy Perspective – 2021)* [15]

Other analyses from books and reports by industry experts [20, 21] estimated that *peak oil* had already occurred in 2005. Developments in the *fracking and tar sands sectors* subsequently provided for an interim recovery period (observe the red spike in the chart below) that extended the abundance of affordable liquid fossil fuels by at least another decade and a half [16, 18] (see: Fig. 7 and Fig. 8).

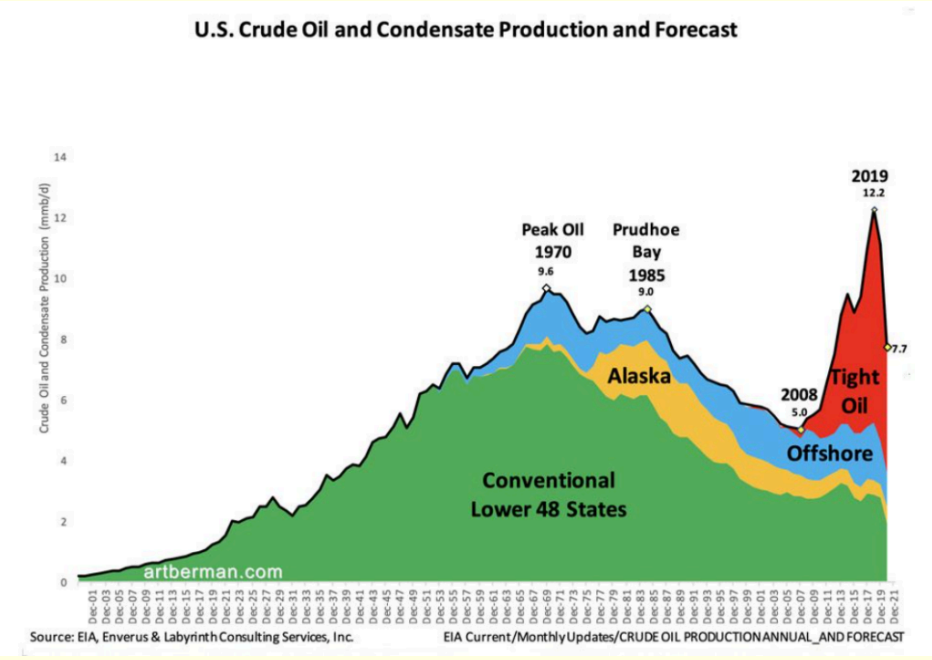


Fig. 7 – US Crude Oil and Condensate Production and Forecast [source] [16]

Although there are expectations that fracking operations for *shale oil (tight oil)* will continue to supplement crude oil production, it is estimated that the production of these resources will stagnate, too. While forecasts vary (and are sometimes adjusted), *the general prognosis* [18] is that of a long-term *shale oil plateau*, with declines expected in the years and decades to come (see Fig. 8).

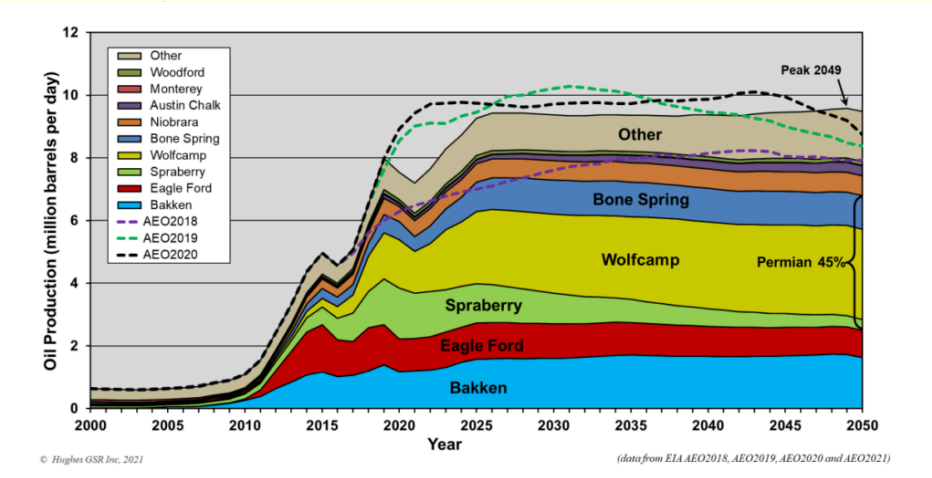


Fig. 8 – US Tight Oil Production by Play in 2021 Forecast Compared to Earlier Forecasts [source] [18]

Some of the factors at work are that returns on investments tend to decline sharply with shale oil operations after new capital-intensive wells are drilled. In short, due to a lack of significant growth in sections of the fracking sector, shale/tight oil would not adequately compensate for crude oil declines (for the entire world). The outlook for Canadian *oil sands (i.e. tar sands)* is similar, or worse [19], compared to *shale oil*.

Recurring Peak Oil

This brings the discussion to when *peak oil* is expected to happen again, and credible independent experts [20, 21] in the energy and mining sectors have concluded that *peak oil* had occurred (for a second time after 2005) between the years 2016 and 2020. The years 2017, 2018 and 2019 are alternatively pinpointed as when energy production started to reach a supply plateau.

> *Globally, new oil discoveries have fallen for 6 years, with consumption of oil six times greater than discoveries from 2013 through 2019. In the US, conventional oil and gas discoveries from 2016 to mid-2020 were at their lowest levels for 70 years. – Alice J. Friedemann (Life After Fossil Fuels: A Reality Check on Alternative Energy – 2021)* [20]

> *Peak oil discovery was in 1962, and since then, rates of resource discovery have been declining persistently. New discoveries are limited: the exploration success rate in 2017 was a record low of 5%, and the average discovery size was 24mbbls. A projected range for the average decline rate on post-peak production is 5-7%, equivalent to around 3-4.5mb/d of lost production every year. – Simon P. Michaux (Oil from a Critical Raw Material Perspective – 2019)* [21]

An important distinction to be aware of is the difference between *oil discoveries versus oil production.* While new oil discoveries have declined for several years, oil production has continued to rise as demand has increased because of economic growth and increasing population numbers. A noticeable exception was during the COVID-19 era when there was a *significant decline* in oil supplies *per person* [22] (see Fig. 9).

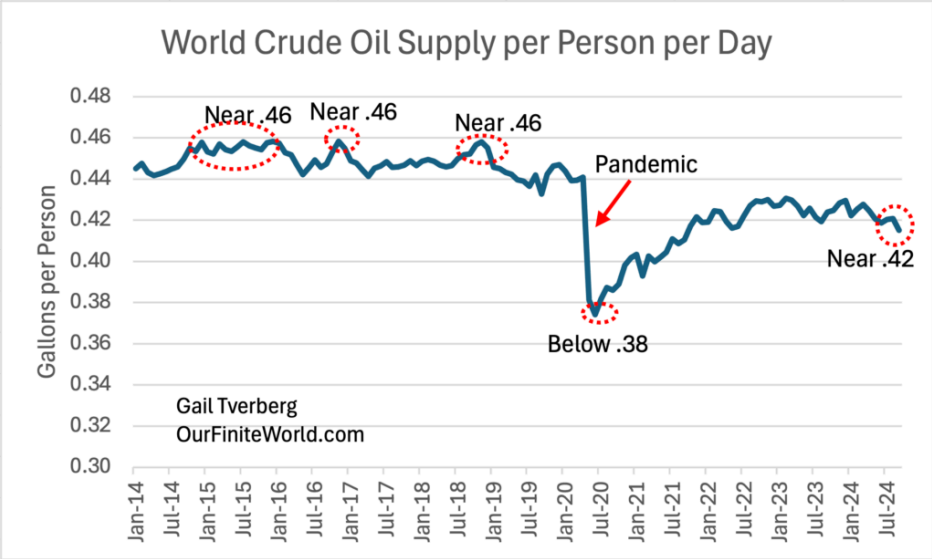


Fig. 9 – World Crude Oil Supply Per Person Per Day – by Gail Tverberg [source] [22]

Should demand and consumption continue to *outstrip* new discoveries and production [16] (see Fig. 10 below), the potential consequences should become relatively clear considering the number of products made from oil and the number of industrial processes dependent on them (discussed in more detail further down).

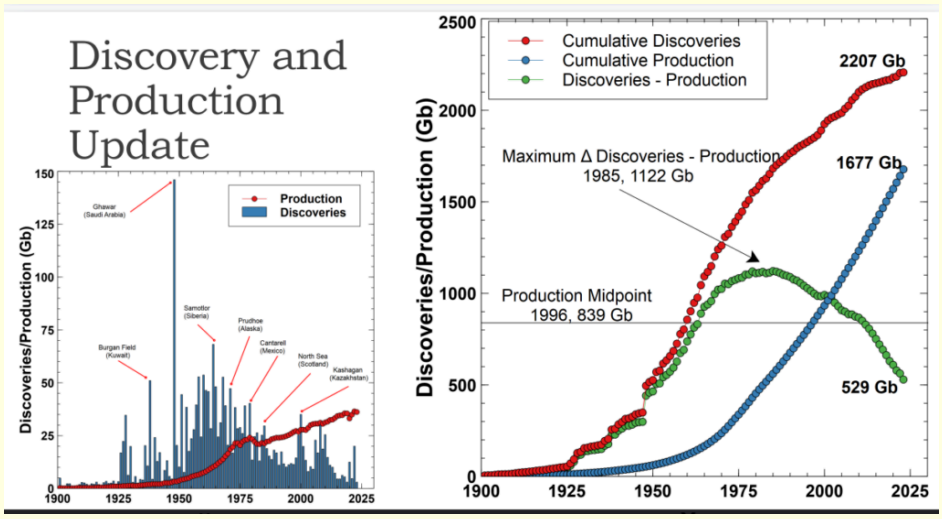


Fig. 10 – Discovery and Production Update – by John Peach [source] [16]

> *The midpoint of production happened in 1992, so half of all oil consumed occurred in the last 28 years. The maximum difference between discoveries and production was 1183 Gb in 1985. Oil is a finite resource, but we've been outstripping the rate of discoveries for 40 years. The difference between production and discoveries is a rapidly growing gap. – John Peach (The Growing Gap)* [16]

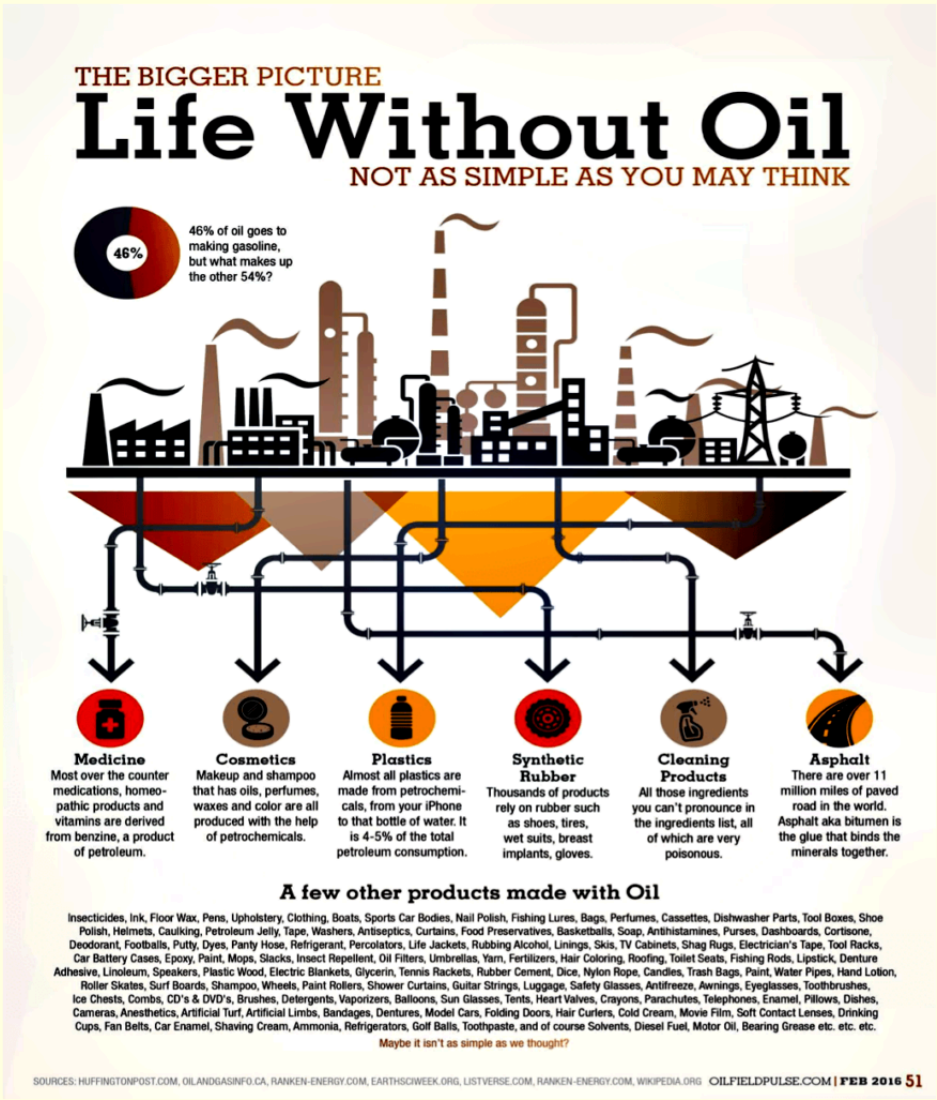
When zooming out to view discoveries versus production [16] (see left chart in Fig. 10), the picture of potential energy shortfalls in a decade or two becomes obvious. Although oil

supplies to the market have almost recovered to *pre-pandemic* levels [22, 17] (see Fig. 9), they have not yet fully recovered (see also charts on *this page* [17]).

The overall long-term outlook reflects future supply constraints as oil production is expected to continuously outpace oil discoveries as demand for oil increases with economic expansion and population growth (despite declining birth rates). Consequently, sooner or later, inflection points are bound to be reached.

Products Made from Oil

Few people are familiar with just how many products are made from oil [23]. Hydrocarbons are required in the manufacturing processes of *a plethora* of items and substances, including (but not limited to) *medicines, plastics, paints, cleaning products, asphalt, insecticides, clothes, soap, cosmetics, deodorants, refrigerants, fertilisers, tyres, tents, gasoline, diesel fuel and motor oil* (see also Fig. 11).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Life Without Oil
NOT AS SIMPLE AS YOU MAY THINK
46%
46% of oil goes to making gasoline, but what makes up the other 54%?
Medicine
Most over the counter medications, homeopathic products and vitamins are derived from benzine, a product of petroleum.
Cosmetics
Makeup and shampoo that has oils, perfumes, waxes and color are all produced with the help of petrochemicals.
Plastics
Almost all plastics are made from petrochemicals, from your iPhone to that bottle of water. It is 4-5% of the total petroleum consumption.
Synthetic Rubber
Thousands of products rely on rubber such as shoes, tires, wet suits, breast implants, gloves.
Cleaning Products
All those ingredients you can't pronounce in the ingredients list, all of which are very poisonous.
Asphalt
There are over 11 million miles of paved road in the world. Asphalt aka bitumen is the glue that binds the minerals together.
A few other products made with Oil
Insecticides, Ink, Floor Wax, Pens, Upholstery, Clothing, Boats, Sports Car Bodies, Nail Polish, Fishing Lures, Bags, Perfumes, Cassettes, Dishwasher Parts, Tool Boxes, Shoe Polish, Helmets, Caulking, Petroleum Jelly, Tape, Washers, Antiseptics, Curtains, Food Preservatives, Basketballs, Soap, Antihistamines, Purses, Dashboards, Cortisone, Deodorant, Footballs, Putty, Dyes, Panty Hose, Refrigerant, Percolators, Life Jackets, Rubbing Alcohol, Linings, Skis, TV Cabinets, Shag Rugs, Electrician's Tape, Tool Racks, Car Battery Cases, Epoxy, Paint, Mops, Slacks, Insect Repellent, Oil Filters, Umbrellas, Yarn, Fertilizers, Hair Coloring, Roofing, Toilet Seats, Fishing Rods, Lipstick, Denture Adhesive, Linoleum, Speakers, Plastic Wood, Electric Blankets, Glycerin, Tennis Rackets, Rubber Cement, Dice, Nylon Rope, Candles, Trash Bags, Paint, Water Pipes, Hand Lotion, Roller Skates, Surf Boards, Shampoo, Wheels, Paint Rollers, Shower Curtains, Guitar Strings, Luggage, Safety Glasses, Antifreeze, Awnings, Eyeglasses, Toothbrushes, Ice Chests, Combs, CD's & DVD's, Brushes, Detergents, Vaporizers, Balloons, Sun Glasses, Tents, Heart Valves, Crayons, Parachutes, Telephones, Enamel, Pillows, Dishes, Cameras, Anesthetics, Artificial Turf, Artificial Limbs, Bandages, Dentures, Model Cars, Folding Doors, Hair Curlers, Cold Cream, Movie Film, Soft Contact Lenses, Drinking Cups, Fan Belts, Car Enamel, Shaving Cream, Ammonia, Refrigerators, Golf Balls, Toothpaste, and of course Solvents, Diesel Fuel, Motor Oil, Bearing Grease etc. etc. etc.
Maybe it isn't as simple as we thought?
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Fig. 11 – Life Without Oil – Not as Simple as You Think [click to enlarge] [23]

As things stand, oil and coal cannot be replaced in the manufacturing processes of the vast majority of industrial items and products, which is unlikely to change in the foreseeable future. Conclusions circle back to the fact that since hydrocarbons and coal have so many byproducts that the industrialised, modern world is dependent upon, the *world as we know it* will not function normally without them.

Peak Oil's Groundhog Day

As illustrated earlier, the reality is that *peak oil* is a recurring phenomenon. Evidence shows that this trend is repeating at an increased pace. When *peak oil* is reached, new discoveries or alternative extraction methods would typically resolve the issue *temporarily*, but *peak oil* would return a few years later. A logical deduction is that when *peak oil* becomes *a constant,* it is bound to overshadow all other *perceived global crises*, resulting in *a reordering of priorities.*

Energy Return on Investment (EROI)

A factor that industry experts are aware of is that although *a lot of oil remains in the ground*, the most easily accessible and highest quality oils have already been extracted. More expensive extraction methods that are yet to be fully developed would be required to access deeper, more difficult-to-reach oil deposits.

On the above point, the life cycle of a normal oil well could be understood within the concept of *Energy Return On Investment,* known as EROI [24]. At first, it is affordable and profitable to extract the highest quality oil from a well, but as the quality diminishes, it becomes more cost-intensive to drill deeper until a break-even point is reached after which it is not profitable anymore.

With oil deposits that are *very deep* from the outset, the EROI [24] would be too low to begin with. Lower profit margins from the extraction operations combined with higher costs for the type of infrastructure required would render it uneconomical and not viable. Since the oil sector is already *highly subsidised* by governments, additional subsidies impacting national debt burdens could become unsustainable or untenable.

End of an Era

All things considered, the prospect of averting peak *cheap oil* is increasingly improbable. Rising food, fuel, and energy costs will necessitate *frugality and lifestyle adjustments.* The sobering reality is that the world has entered the *end of an era.*

We were fortunate enough to have been born into a time of wide-scale prosperity such as the world has never seen in history, but this recent era of abundance has only been possible because of cheap energy generated from *easily obtainable oil, coal and natural gas.*

Future Scenario Planning

When consulting sources related to *future scenario planning*, the following conclusions can be reached: Advance knowledge on the part of decision-makers with regard to future declines in fossil fuels (estimated to happen between the years 2020 and 2030, according to the LTG reports), combined with uncertainty about whether unconventional oils would adequately replace fossil fuels, played an important role in *the planning of an energy transition ahead of time.*

Shifting the world into *a renewable energy paradigm* based on *minerals* as a foundation with an interconnected economic growth paradigm (i.e. the *green economy)* appears to have been the preferred choice of action, which was envisioned decades ago as a solution for *a future global peak oil scenario.* This was evidently preceded by *early global thinking* [25-27] and *comprehensive future scenario planning* [28-31] after "The Limits to Growth" [14] was published, followed by numerous follow-up reports and books inspired by it.

Peak Oil: "The Final Verdict"

The trends covered in this essay have shown that some of the models presented in the 1972 ("normal run scenario") [14] and 2004 ("future state" model [13]) LTG reports were *broadly correct* in their analysis. As illustrated, real-world industry trends have, since the 1970s, correlated quite well in general with LTG forecasts as far as *conventional liquid fossil fuels* are concerned. Moreover, it seems that *unconventional oils and minerals* appear to show similar trends, although at a slower pace.

A research paper of 2022 titled "How much oil remains for the world to produce? Comparing assessment methods, and separating fact from fiction" [32] by Jean Laherrère *et al.* sums up what could be considered *a final verdict* (as far as research for this project is concerned) on the pressing questions of (1) *whether peak oil is real* and *(2) when it would become a constant.*

> *If we add to conventional oil production that of light-tight ('fracked') oil, our analysis suggests that the corresponding resource-limited production peak will occur soon, between perhaps 2022 to 2025. If then we add tar sands and Orinoco oil, the expected resource-limited total peak occurs around 2030. However, there is a major question over whether significantly increased production rates of the latter two classes of oil are possible. Finally, the resource-limited production peak of global 'all-liquids' is expected about 2040 or a bit after if the latter liquids are also produced at the maximal rate. – J. Laherrère et al. (How much oil remains for the world to produce? Comparing assessment methods and separating fact from fiction – 2022)* [32]

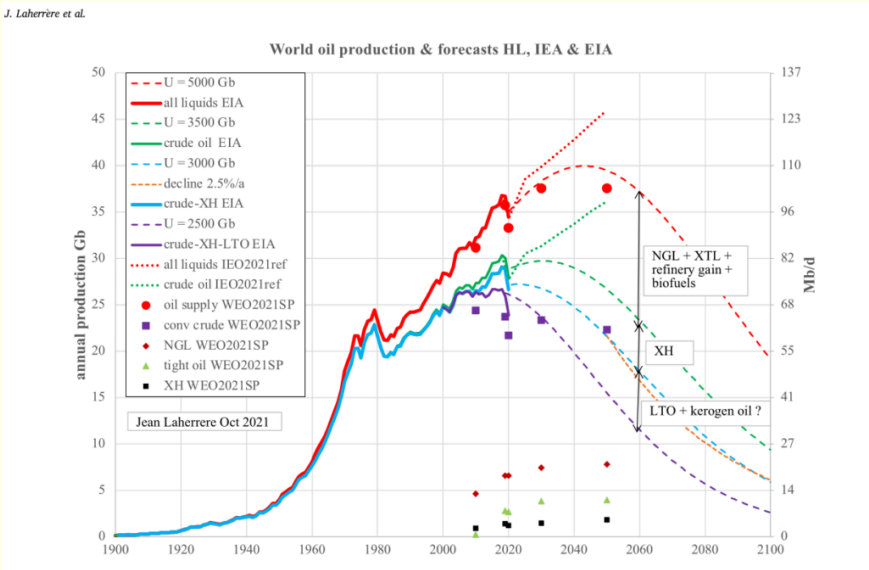

Fig. 12 – World Oil Production and Forecasts HL, IEA, EIA [source] [32]

Abiotic Oil

An interesting phenomenon within alternative media is that some writers embrace a belief that *abiotic oil* [33] would provide solutions for an energy crisis and that the concept of *peak oil* is a false construct. However, credible and comprehensive resources factually supporting such beliefs are never produced on request after pundits make those claims.

Doing independent research on the subject does not yield many results either. While *abiotic oils* may provide future solutions when new technologies become available to access them, there seems to be *no clear evidence* (when reading the opinions of industry

experts on the subject [33]) that abiotic oil would provide viable solutions in the short or the near term.

Unknown Unknowns

> *The Hubbert Curve is a method for predicting the likely production rate of any finite resource over time. When plotted on a chart, the result resembles a symmetrical bell-shaped curve. The theory was developed in the 1950s to describe the production cycle of fossil fuels. However, it is now considered to be an accurate model for the production cycle of any finite resource. – Hubbert Curve (Investopedia)* [34]

It is worth bearing in mind that there are always *unknown unknowns* [35]. Some analysts are of the view that the Hubbert Curve [34] method that is used for *peak oil modelling* lacks accuracy because it fails to take certain issues into account [36], such as future technological advances or unexpected geopolitical disruptions.

That being the case, the same may be said about any type of future modelling, meaning that *unforeseen circumstances* would always be part of future reality – not everything can be anticipated – which is why any frameworks that are used for forecasting should always be viewed as conceptual mechanisms that have limitations.

For example, when the first LTG reports were released, *the shale oil revolution,* as well as oil extraction from Canadian *tar sands* were *unknown unknowns* [35] at the time. However, these *unconventional oils* have only provided *a temporary respite* from *peak oil* returning. Long-term *peak oil* is still set to happen in the immediate decades ahead of us.

Abiotic oil *could* – hypothetically speaking – have provided another reprieve, but that did not happen. Always hoping that *unknown unknowns* would come to the rescue in the form of "lucky breaks" is not a sound strategy.

Implications of Peak Oil

> *Given the societal dependence on oil and the difficulties in achieving a transition to low-carbon energies in time, such a peak is likely to have deep consequences that are not yet fully understood and which might handicap the transition itself. – Delannoy et al. (Peak Oil and the Low-carbon Energy Transition: A Net-energy Perspective – 2021)* [15]

Since virtually all modern systems are underpinned by fossil fuels (industrial food production and modern transport systems being important examples), *maintaining globalisation at the same level* by using alternative energies will not be feasible since renewable energies are not capable of replicating the energy output (due to differences in energy densities) of liquid fossil fuels or coal (another factor well-known by industry experts).

A complete or *total energy transition* away from fossil fuels and hydrocarbons is, therefore, simply not technically possible. At the same time, nuclear energy has limitations, too, since it is primarily used for *electricity generation*. Lubricants and other important byproducts from oil, gas and coal cannot be produced by nuclear energy, solar power, wind energy, or hydroelectric schemes.

> *The current system was built with the support of the highest calorifically dense source of energy the world has ever known (oil), in cheap, abundant quantities, with easily available credit and seemingly unlimited mineral resources. – Simon P. Michaux (Assessment of the Extra Capacity Required of Alternative Energy Electrical Power Systems to Completely Replace Fossil Fuels – 2021)* [37]

The most probable real-world outcome would be that *a range of alternative and renewable energies* would continue to supplement conventional oil production but would not fully replace it, while *a general plateau* and subsequent decline could be expected to unfold in the next 50 years. In other words, looking at the issue of *peak oil* from various perspectives yields similar conclusions.

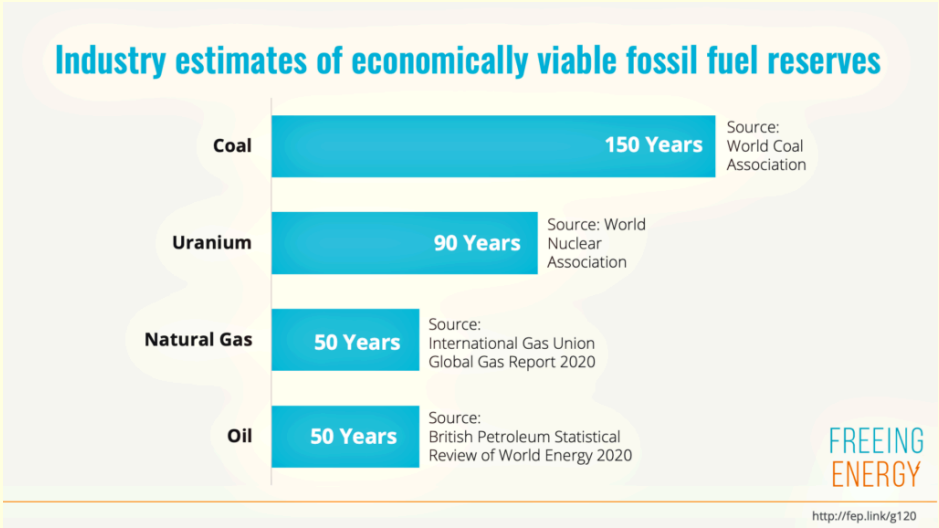

Fig. 13 – Industry Estimates of Economically Viable Fossil Fuel Reserves [source] [38]

Oil and coal are unlikely ever to be phased out entirely, notwithstanding global campaigns or policies to that effect. As the declines of liquid fossil fuels deepen, most countries would probably revert to coal (there are more coal reserves left than oil [38]) and expand their nuclear power generation capacities (there is still sufficient uranium left too [38]) while countries lacking nuclear power are likely to add it to their overall energy-mix.

Reinforced Dependencies

To recap a point made before (in the previous chapter), there's significant irony in the fact that the world's *fossil fuel dependencies* are being *reinforced* by the introduction of *renewable energy devices and installations.* These items and infrastructure cannot be produced or installed without fossil fuels. Furthermore, they need to be *replaced* periodically, which is why they are referred to as "replaceables" in some energy discussion groups.

The Energy Expansion

The practical outcomes of the *energy transition* reveal that an introduction of alternative energies typically results in an *expansion of energy production* into additional methods of production, rather than resulting in a *transition away from fossil fuels*. This has been confirmed by a recent analysis illustrating a *big-picture view* of energy consumption over the last 200-plus years (see Fig. 14).

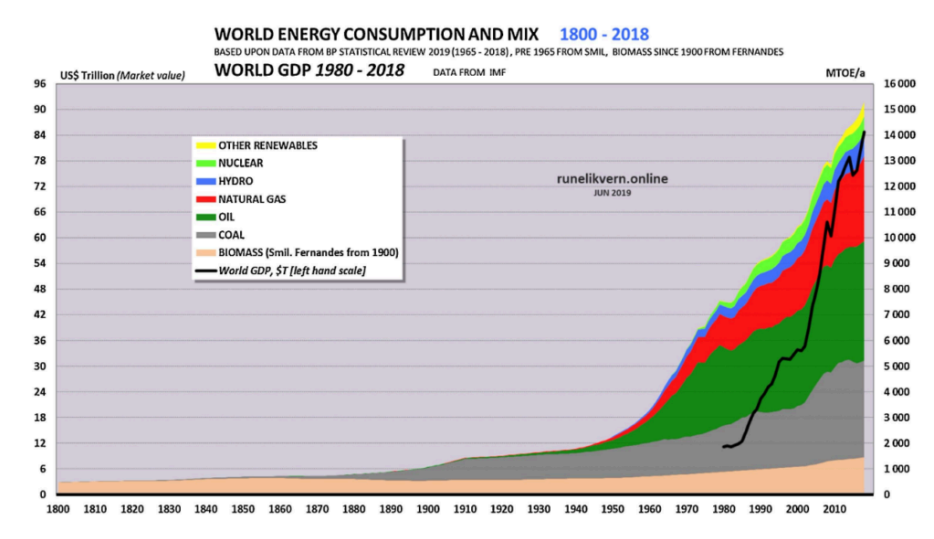

Fig. 14 – World Energy Consumption and Mix 1800 to 2018 [source] [16]

> *A plot of energy consumption over the period 1800–2018 shows that energy consumption of all types is generally increasing. We aren't substituting one form of energy for another: we're just adding more energy from all sources to the mix. – John Peach (The Growing Gap)* [16]

The trend clearly shows how world GDP has risen over the decades as a result of ever-increasing energy consumption. A cause-and-effect deduction (and it is worth pausing on this factor for a moment) is that *when energy production and supplies reach a plateau, so would world GDP.* After a period of stagnation, a decline in world GDP could be anticipated should no other compensatory growth strategies emerge (for which brainstorming essay contests [40] were launched in some zones, apparently).

In light of everything discussed so far, it would be fair to say that the use of primary fossil fuels such as oil and coal will continue indefinitely in the background. In contrast, the *energy transition* will continue to be promoted for commercial and economic reasons rather than for the environment. At the same time, the objective of having alternative energy generation capacities *in place* for softer landings when energy disruptions arrive would be met, too.

Whether intentional or not, "anti-oil" and "anti-coal" activism merely provide additional momentum by way of "moral causes" for an expansion into *renewable energy* production while masking that it is a *diversification of the energy sector into a wider array of energy production* methods and systems (within the overall energy landscape) that's underway under the banner of a (so-called) *green energy transition.*

As an aside, one of the main reasons why less developed (yet resource-rich) nations are becoming more vulnerable to outside interventions is related to the fact that "minerals have become the new oil" (which is a phrase used by some people in the *renewable energies* sector [39]).

Introducing Peak Minerals

An unknown reality is that the world will not only be arriving at *peak oils* but also at *peak minerals.* In-depth feasibility studies have shown that to accomplish a comprehensive transition away from an economy based on fossil fuels to one primarily based on minerals (for the production of renewable energy installations and technologies), *enormous quantities of critical minerals would be required.*

Research by experts in the mining and energy sectors has shown that there simply will not be sufficient key minerals to make a full energy transition. Consequently, a mineral-based industrial system would not be feasible *at scale* without the supplemental support of fossil fuels, and it would not be *practicable* beyond two or three generations (for details, please see referenced reports [37, 41]).

> *"The replacement needs to be done at a time when there is comparatively very expensive energy, a fragile finance system saturated in debt, not enough minerals, and an unprecedented world population embedded in a deteriorating natural environment. – Simon P. Michaux (Assessment of the Extra Capacity Required of Alternative Energy Electrical Power Systems to Completely Replace Fossil Fuels – 2021)* [37]

These realities have been highlighted extensively by associate professor Simon Michaux of the GTK Institute in Finland. His work (several reports) makes for compelling reading as it provides a fundamental understanding of the *serious mineral limits* that the world will be facing in the not-too-distant future. Other experts have come to similar conclusions, notably Mr Mark Mills from the Skagen Foundation in Norway. [41]

Healthy debates (in the form of video presentations, interviews and conferences) about all these factors can be found online, and readers are encouraged to familiarise themselves with the results of the reports mentioned. Being aware of the *real-world limitations* of making a *full transition* into a mineral-based energy paradigm consisting of solar panels, wind turbines, and electric cars is essential. Conclusions point to the fact that *peak minerals* (copper being a case in point) will almost certainly follow *peak oil.*

Since most people have major blind spots when it comes to the concept of *peak oil,* and because the concept of *peak minerals* is simply beyond their awareness, these looming challenges are unlikely to become widely known before shortages set in. Consequently, citizens will face the practical realities of *peak oil and minerals* in stops and starts as the years go by.

Contraction Economics

> *"The industrial ecosystem is in the process of transitioning from growth-based economics to contraction-based economics. This will affect all sectors of the global ecosystem, all at the same time (in a 20-year window). We are there now and should respond accordingly. – Simon P. Michaux (The Mining of Minerals and the Limits to Growth – 2021)* [42]

> *"People have a misimpression regarding how world peak oil can be expected to behave. The world economy has continued to grow, but now it is beginning to move in the direction of contraction due to an inadequate supply of crude oil. – Gail Tverberg (An energy and the economy forecast for 2025)* [43]

A decline in fossil fuels which would ultimately be beyond the control of humans, would mean the stagnation of economic growth in many sectors. As a result, *growth economics* is expected to turn into what has been described as *contraction economics.*

How that would unfold internationally remains unclear since not all economies, sectors or regions are the same, but as highlighted in another essay [44], the reality is that *few*

people are prepared to willingly give up modernity, which is to be expected since we live in an era of hyper-materialism.

It must be acknowledged, though, that there is a growing number of people who "have seen the future" (and have seen the *light)* because they are sufficiently informed about *peak oil* (as well as *peak minerals),* allowing them to make the *required mind-shifts* in anticipation of an imminently changing paradigm. Many are actively pioneering solutions for localised self-sufficiency in line with *authentic environmental consciousness*.

Towards a More Natural Order

Considering all the factors evaluated could lead one to realise that effective long-term solutions should ideally revolve around *less urbanisation and modernisation and a return to a simpler way of life.* However, the world is still travelling in the opposite direction with accelerated momentum, but evidence of significant turnarounds is already starting to appear in the first quarter of 2025 (related to the impacts of global tariffs imposed by the USA).

Considering our ultra-materialistic, consumer-driven world featuring industrialisation and globalisation powered by an abundance of affordable fossil fuels to date, there's been no growth of a collective awareness or a universal consciousness that would lead populations toward *early transitions* away from excessive materialism towards more responsible and less extravagant lifestyles. It is up to individuals and small communities to lead the way, but as awareness of our predicament grows, more people will come on board. However, the changing energy landscape will inevitably necessitate adjustments.

This transition may prove psychologically challenging, especially for people who are committed to the belief that *peak oil* is a false construct. The evidence presented in this essay suggests the contrary, that *peak oil is a very real phenomenon.* Although not wanting to go back in time is a default position for most humans, history tends to rhyme, which, *from a cyclic perspective,* would revolve around reverting back to more classic ways of living.

A renewal and a return to a *more natural order* in which humans interact more symbiotically with nature and live more in harmony with it will, over time, be brought about by unavoidable energy realities which will be accompanied by *mind-shifts* related to a *change in the spirit of the age* (see also *The Lights Along the Way).*

Mind-Shifts, Off-ramps and Exit Strategies

By facing *the truths* of our energy predicaments, suitable exit strategies and off-ramps can be envisioned, but first, *mind-shifts* are required in terms of acknowledging the realities that we are facing. If renewable energies will not provide long-term solutions, and if it is almost certain that the world will undergo an energy decline, real solutions should logically revolve around *decentralisation.*

To recap once more, unlike environmental, population and climate crises, global constraints in fossil fuel supplies could result in a genuine worldwide energy crisis due to the volumes of oil that industrial economies require to function until such time that countries *find their feet* in terms of *energy localisation,* which will take time. In the interim, *renewable energies* can only provide partial or temporary solutions.

The Hierarchy of Crises

If a *hierarchy of crises* is to reflect crises ranked in terms of posing a threat to the basic functioning of societies, the order of the hierarchy will shift dramatically when the real-

world consequences of *peak oil and peak minerals* make themselves felt.

The current *global hierarchy of crises* features a purported "climate crisis" at the top of the list because comfort zones allow people to be less discerning about which crises they think of as the most pressing.

Navigating the Challenges

> *Our current overly materialistic awareness of energy will, over time, give way naturally to a growing metaphysical energy awareness, and that will happen incrementally as the metaphysical energy seasons change. On a practical level the world is likely to face many challenges going forward in terms of having to adapt to a less resource intensive civilisation, simply because fossil fuels are dwindling (Cf. The Lights Along the Way)* [45]

The economic growth imperative *demands* our way of life within the context of a ubiquitous globalised consumer culture, which (truth be told) is a trap that few people really want to escape from. In a highly materialistic age material growth is automatically prioritised over spiritual growth, while the contrary is true during a spiritual age.

The consciousness of our present era is sorely lacking in spirituality because we are *at the end of a large metaphysical cycle* [45]. The upside is that *this epoch is finally drawing to a close*, challenging us to *prepare for navigating the upcoming changes* courageously and purposefully by knowing what issues will have to be dealt with (some have been discussed in this essay).

In the future, *authentic environmentalism* will re-emerge when less materialistic mindsets flourish after humanity has passed through its *adaption bottlenecks* due to the repercussions of *peak-fossil fuels* followed by *peak minerals.* Localisation strategies that place people in closer proximity to nature would once again foster genuine care for the environment through more authentic engagement with it.

Towards Decentralisation

The concept of there being limits to material and economic growth depends on whether local or national resources are considered *in isolation*, or whether they are analysed within a global context. The picture changes dramatically when the focus is shifted to *local growth* by *decoupling* from mindsets that are dominated by global growth considerations.

All regions are resource-rich in their own particular ways while being resource-poor in other respects, but globalisation has masked these particularities and disparities. Unique local strategies tailored to local circumstances may pave the way for a variety of localised solutions in the face of a global economic growth crisis as a result of resource constraints in the fossil fuel sectors.

Although there's still significant momentum behind *mass centralisation* (as a consequence of globalism and globalisation), it can be observed that sentiments are *starting to shift towards decentralised solutions* as they are clearly more logical and practical in the face of a number of crises related to the globalised nature of supply chains and due to growing conflicts in energy-rich regions.

Recalibration Required

The writer would suggest that in preparing for a changing paradigm, a recalibration in thinking is required in how crises are prioritised. The following adjustments may be considered in the process:

- Acknowledging our fossil fuels dependencies.
- Acknowledging peak oil.
- Acknowledging that renewable energies have serious limitations.
- Acknowledging the destructive impacts of renewable energies on the environment.
- Acknowledging that shortages in key minerals will limit the energy transition.
- Acknowledging that lifestyle adjustments will be required despite the energy transition.
- Admitting that climate change is not the most pressing problem facing humanity.
- Shifting mindsets to local growth strategies decoupled from global growth solutions.
- Returning to an authentic environmental consciousness.
- Developing and prioritising spiritual growth strategies for psychological resilience.

To be continued...

By J.J. Montagnier

Published: May 9th, 2025 at GypsyCafe.org

Related article: *Going Beyond Limits to Growth*

Please note that using selected quotes and citations does not imply that the writer supports the entire worldviews of the persons cited or the conclusions contained in the referenced materials. The approach is to identify valuable pieces of information and isolate important facts for independent analysis through critical thought for fresh perspectives and a unique understanding of unfolding events.

J.J. Montagnier is an independent researcher and writer based in the Southern Hemisphere, at a midpoint between West and East. The views and opinions expressed are those of the writer. This content is provided for educational objectives as a public service and is not for commercial use.

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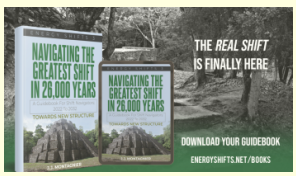
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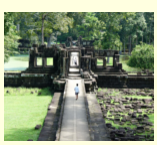

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